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The use of marine wildlife-watching codes and their role in managing activities within marine protected areas in Scotland

Citation for published version:

Inman, A, Brooker, E, Dolman, S, Mccann, R & Wilson, AMW 2016, 'The use of marine wildlife-watching codes and their role in managing activities within marine protected areas in Scotland', *Ocean & Coastal Management*, vol. 132, pp. 132-142. <https://doi.org/10.1016/j.ocecoaman.2016.08.005>

Digital Object Identifier (DOI):

[10.1016/j.ocecoaman.2016.08.005](https://doi.org/10.1016/j.ocecoaman.2016.08.005)

Link:

[Link to publication record in Edinburgh Research Explorer](#)

Document Version:

Peer reviewed version

Published In:

Ocean & Coastal Management

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Coastal Management

Elsevier Editorial System(tm) for Ocean &

Manuscript Draft

Manuscript Number: OCMA-D-16-00159R1

Title: The use of marine wildlife-watching codes and their role in managing activities within marine protected areas in Scotland.

Article Type: Research Paper

Keywords: marine mammals and megafauna; basking shark; marine wildlife watching; codes of conduct; Scotland marine protected areas and planning

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31 March 2016

Dear Editors of Ocean and Coastal Management,

It is with pleasure we submit the following research manuscript:

The use of marine wildlife-watching codes and their role in managing activities within marine protected areas in Scotland.

This work is a result of four authors whose backgrounds and experiences bring together marine science, management, policy and practice, as we collectively come from academia, government and non-government.

As Scotland is a global leader on practices around ocean and coastal management that integrate both conservation and blue growth horizons, one of the key emerging issues and opportunities is the nexus of marine nature based tourism with marine wildlife, e.g. megafauna in particular.

Currently there is a confluence of international and national aspirations in creating new modes of dynamic marine protected areas that take into account the life history considerations (temporal and spatial) of 'marine mammals, sharks, turtles'. Scotland's new 'Sea of the Hebrides' MPA is noteworthy as it is listed for: minke whales, basking sharks, and significantly the productive bathymetric features that support plankton prey as well as sea-floor elements, providing an robust illustration of integrated 'ocean and coastal management'. Similar trends are evident in Australia, North America and Europe. Interestingly this niche is cultivating audience interest in participatory marine fauna watching, beyond boat and shore based observations, but increasingly 'swim-with' experiences. This brings about new opportunities and challenges to better understand the intersections (literally) with the animals and observers, increasingly requiring new 'codes of conduct' to ensure positive experiences for animals and people alike.

With the Sea of Hebrides as an inspiration, we found ourselves taking a deeper look at the literature (academic and practitioners), finding that the guidance on such interactions was inconsistent, largely anecdotal, even within Scotland (and globally), and often relying on voluntary compliance by operators. Most critically there were very few studies on observed monitored interactions of the guidance to see if it was complied with, and even if so, to assess if it was effective and positive in outcome – again for both marine animals and people.

Thus our research reviews both the policy and practice currently emerging in Scotland, but is framed within this global trend. We hope you find it interesting and worthy of publication, to encourage more engagement in between scientists, ecotourism operators, statutory bodies and local communities on this rich arena.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Meriwether Wilson'.

Dr. Meriwether Wilson
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The use of marine wildlife-watching codes and their role in managing activities within marine protected areas in Scotland

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Highlights

- The five main UK marine wildlife watching codes are inconsistent in guidance
- All Scottish codes advise against deliberate human interactions (such as swim-with)
- There is limited monitoring and evidence on the effectiveness of codes in practice
- A formal, single comprehensive code could better support implementation and awareness
- Further research is needed on environmental impacts of marine wildlife watching

Highlights

- The five main Scottish codes are inconsistent in key messages and policies
- All Scottish codes advise against deliberate human interactions (such as swim-with)
- A single, comprehensive code would be more suitable and measureable
- Further research is needed on environmental impacts of marine wildlife watching

Abstract

Marine wildlife-watching is a developing industry in Scotland contributing to overall growth and aspirations of the marine tourism sector. Despite European-level legal protection of cetaceans, and Scottish legislation for the protection of seals at designated haul-out sites, there are currently no formal or mandatory regulations to specifically manage tourism activities in relation to marine wildlife. However, most Scottish wildlife-watching operators adopt one, or more, five key voluntary codes of conduct which have been developed in the UK since 2003. In this paper, we review the consistency of policy messages and recommendations across voluntary codes of conduct for the UK and Scotland, taking into consideration global use and effectiveness in the use of similar codes. In this context, we specifically examine the potential impacts of wildlife watching and management of future activities, both within and outwith marine protected areas (MPAs) in Scotland. For this, the research also incorporates data from field surveys, *in-situ* observations and operator questionnaires conducted in Scotland relating to the implementation of the codes in practice. Key findings highlighting consistencies in some of the key recommendations across the five UK codes in particular, the distance and speed when approaching an animal. However, all of the codes also have some similarities, including advising against deliberate human interaction, e.g. swimming with marine megafauna, including a separate code on basking sharks, published by the Shark Trust in the UK.. In light of the growing network of wildlife-focused MPAs in Scotland (in particular the Sea of Hebrides proposed MPA for mobile species), and national aspirations for the growth of the marine tourism sector, we consider the potential implications of unregulated wildlife watching and the conservation objectives of protected areas for marine mammals and basking sharks. We also provide recommendations on how more formal wildlife-watching regulations could enhance MPA effectiveness and contribute to the emerging processes for Regional Marine Plans across Scotland and provide some insights for global marine wildlife tourism.

Keywords: marine mammals; basking shark; wildlife watching; code of conduct; conservation, disturbance, marine protected areas; marine planning

1. Introduction

Wildlife-watching is a relatively recent development within the global tourism industry, which involves the organised or incidental viewing of animals in their natural environment. It is broadly considered to be an ‘environmentally-friendly’ form of tourism and is increasingly contributing to tourism portfolios and economies for many countries (Duffus and Dearden, 1990; Tapper, 2006). Wildlife-watching and ecotourism can have multiple benefits, such as supporting conservation efforts through data collection, employing and uniting local communities, and increasing public awareness about environmental issues (Stem *et al.* 2003; Stronza and Gordillo, 2008). Marine wildlife-watching tours can be used as platforms for scientific research and used to educate the public on conservation issues relating to cetaceans (whales, dolphins and porpoises - IWC, 2013). This can sensitise people to the conservation threats of these species, and as a result, raise environmental awareness (Garrod & Fennel, 2004). However, emerging evidence indicates that there can be potential negative impacts of human interactions with wildlife, primarily on the species of interest to marine wildlife-watching, which can have immediate and cumulative effects on the animals behaviour (Green and Giese, 2004).

Unlike other boat traffic, marine wildlife-watching boats repeatedly target and remain with an animal rather than passing by (Wursig & Evans, 2001; Erbe, 2002; Lusseau & Bejder, 2007). Boat presence can interfere with the ability of marine wildlife to communicate due to boat noise, and disrupt behaviour such as feeding, during which an animal may avoid interacting with a boat (Erbe, 2002; Lusseau, 2004; Williams *et al.*, 2006; Parsons, 2012). These changes in energy expenditure can have short- and long-term negative impacts on individuals and populations, potentially reducing fitness, the reproductive capability of individuals and the overall health of a population, and pose a threat to small populations (Erbe, 2002; Lusseau & Bejder, 2007).

1.1 International Regulation of Marine Wildlife-Watching in MPAs

A ‘protected area’ is defined by the IUCN as ‘*a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values*’. There are a number of ways that marine tourism is managed around the world through marine protected areas (MPAs) and other marine designations (such as marine reserves) (Hoyt, 2012). Zoning, permits, codes of conducts, and enforced minimum approach distances are all strategies used to manage marine wildlife-watching activities within protected areas for cetaceans (Reeves, 2000; Notarbartolo-di-Sciara *et al.* 2008; NOAA, 2014). There are a number of examples globally where there has been poor compliance to statutory and voluntary regulations, such as in South Australia where authorities have had to limit the number of marine wildlife-watching operators in the area Allen *et al.* 2007. In 2004, approximately

one-third of global cetacean-watching codes were regulatory, with two-thirds adopted on a voluntary basis (Garrod and Fennel, 2004; Parsons, 2012).

Species-specific codes of conduct provide more targeted management enabling the establishment of stricter regulations to limit disturbance to species within particular locations (Giles, 2014). For example, in the Hawaiian Islands Humpback Whale Marine Sanctuary, there is a legally enforced minimum approach distance of 100 yards for approaching humpback whales in the sanctuary, which is applicable for both recreational and commercial boat users (NOAA, 2014). These more specific codes of conduct can be designed to allow for seasonal species distributions and tourism cycles, making the management more targeted to the preferences of the animals.

The allocation of an MPA can act as a marketing tool that raises awareness for marine wildlife-watching activities as protected areas are often synonymous with tourists as high-quality examples of a particular habitat, encouraging growth of the industry (Warburton *et al.*, 2001; Reinius & Fredman, 2007). In the process, however, the profile of an MPA can increase pressure and the degradation of the environment (Buckley, 2012). For example, MPA designation in the Medes Islands, Spain, in the 1980's resulted in large increases in unregulated diving activity that damaged benthic communities (Badamenti *et al.*, 2000; Milazzo *et al.*, 2002).

The ideal situation is for a particular marine environmental setting and species to be managed in such a way that the species can actually benefit from tourism and MPA designation. Potts *et al.* (2014) suggest that '*protection will maintain an ecosystem in good ecological condition, which will have a positive effect on the delivery of ecosystem services,*' which in this case is the marine wildlife-watching industry. Therefore, there is the potential that optimal protection of the environment will benefit both the environment and the industry if appropriate regulations are in place and adhered to.

1.2 Marine protected areas in Scotland

In Scotland, there is a growing network of MPAs, some of which are designated or proposed for the conservation of cetaceans, pinnipeds (seals) and chondrichthyan (sharks, rays and skates); these sites are summarised in Table 1. Given the dynamic nature of marine wildlife in time and space across different life-history stages, the management connection with typically static zoning and spatially oriented activity management is a growing area of interest to researchers and practitioners alike (Cañadas *et al.* 2005; Hooker *et al.* 2011). MPAs are increasingly considered to be an important tool for biodiversity protection under a number of international frameworks and are beginning to

demonstrate some effectiveness where monitoring has been carried out (Gormley *et al.*, 2012; O'Brien and Whitehead, 2013). A number of studies have demonstrated that spatial protection and management within MPAs can lead to an increase in higher predator populations (such as sharks), and furthermore can be highly attractive for marine tourism with economic opportunities through local management (Brunnschweiler, 2010; Jaiteh *et al.*, 2016).

All European cetacean species, pinnipeds and basking sharks are currently protected from deliberate or accidental harassment, injury or death through national transposition of the EU Habitats Directive (1992) and the Nature Conservation (Scotland) Act 2004. Some are listed as qualifying species for spatial protection within Special Areas of Conservation (SACs), including bottlenose dolphin and harbour porpoise. Furthermore, in Scotland, since the introduction of the Marine (Scotland) Act 2010, nature conservation marine protected areas (ncMPAs) have been identified for selected mobile species based on evidence of significant areas where species aggregate for key functions or life stages (e.g. feeding or spawning). Nature conservation MPAs mandate considerations for licensable activities, through the environmental impact assessment stage, and a separate process is currently underway in Scotland to determine ncMPA and SAC management measures for non-licensable activities, including commercial fisheries. At present, based on the current implementation of MPA management options in Scotland, it appears no additional statutory management considerations will be given to recreational use and wildlife-watching within MPAs under the Act, and there is little evidence available that these activities have a site-level impact on protected species within many of these sites. However, voluntary measures within the Moray Firth bottlenose dolphin SAC, where impacts have been demonstrated (Hastie *et al.*, 2003; Cheney *et al.* 2012) and the industry is considered to be at capacity (Lusseau, 2013), are currently being tested (personal observation, S. Dolman).

Marine tourism is considered as part of Scotland's National Marine Plan, which was adopted in March 2015 and includes marine planning policies to comply with codes of conduct for marine wildlife-watching. Scotland's National Marine Plan also contains reference points for the development of Regional Marine Plans. These will be important mechanisms for considering the management of wildlife-watching within specific MPAs and local sea areas for specific species. Furthermore, Scotland, a country with a strong commitment and reputation for nature-based tourism, plans to increase its marine tourism industry, including wildlife-watching, as evidenced through an action plan¹, launched in November 2015, to enhance the value of the marine tourism industry by nearly £100 million..

¹ Awakening the Giant, a Strategic Framework for Scotland's Marine Tourism Sector: <http://scottishtourismalliance.co.uk/wp-content/uploads/2014/02/Awakening-the-Giant-final.pdf>

141 **Table 1: Summary of spatial protection measures for cetaceans, pinniped and chondrichthyan species in Scotland (up-to-date March 2016)**

142

143 SEE SEPARATE File

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1.3 Regulation of Marine Wildlife-Watching in Scotland

The regulation of marine wildlife-watching can be divided into two forms of management: formal and voluntary (Duprey *et al.*, 2008; Garrod & Fennel, 2008). Formal regulations are mandatory guidelines established by government through administering permits or licences, codes of conduct and area and species restrictions (Gjerdalan & Williams, 2000; Garrod & Fennel, 2004; Duprey *et al.*, 2008; Queensland Government, 2013; Giles, 2014). Voluntary management depends on informal agreements and is increasingly used to incorporate conservation goals and concerns without requiring government regulations (Garrod & Fennel, 2004; Duprey *et al.*, 2008; Wiley *et al.*, 2008). For marine wildlife-watching activities in particular, codes of conduct are commonly used as a way of managing the industry on a voluntary, self-regulatory level by the operators (Gjerdalan & Williams, 2000), and/or in conjunction with regulatory measures (Allen *et al.*, 2007). Wildlife tour operators, along with other types of nature-based tourism businesses (e.g. SCUBA diving companies) tend to be locally owned and play an important role in their local communities. For example, through employment or attracting visitors – Parsons *et al.*, 2003), with some becoming involved in local management initiatives, such as the Moray Firth ‘Dolphin Space Programme’ (Arnold 1997).

There are advantages and disadvantages to voluntary and statutory codes of conduct for wildlife-watching. Statutory regulations ensure the accountability of operators or leisure users by establishing requirements to monitor and enforce wildlife-watching activities. However ‘top-down’ approaches to management require oversight may be less well-received by operators, and there is a general preference for non-statutory NGO- or operator-led regulation (Parsons and Woods-Ballard, 2003). Handing management over to operators and local wildlife guides can impart a moral duty towards protecting the communities’ best interests and can encourage compliance with the code (Gjerdalan and Williams, 2000; Parsons and Woods-Ballard, 2003; Garrod and Fennel, 2004). Operators need to feel confident that the codes will also help support sustainability of the tourism industry, and providing protection to wildlife (Hughes, 2001). However, voluntary codes rely on the integrity of the operators to adhere to the guidelines and are harder to enforce. The risk of disturbance to wildlife may be less certain; operators who follow good practice may be disadvantaged by others who fail to do so. Furthermore, voluntary guidelines can enable the perception that the tourism industry is being regulated and disturbance to wildlife is understood and being minimised. It may be assumed that no other form of regulation is needed, resulting in less confirmation that the voluntary guidelines are being monitored and are effective (Wiley *et al.* 2008). Unlike mandatory regulations, voluntary codes of conduct need to be constantly reinforced through education and awareness campaigns and may not necessarily be self-sustaining as a long-term measure particularly in a growing industry (Berrow, 2003),

The marine wildlife-watching industry in Scotland is managed largely through using voluntary codes of conduct (Woods-Ballard *et al.* 2003), incorporating local knowledge and demonstrating a high degree of engagement and responsibility (Garrod and Fennel, 2004). Parsons and Woods-Ballard (2000) reviewed the use of the different types of codes of conducts being used specifically by whale-watching operators, at which time the primary code in use was the ‘Scottish Marine Wildlife Operators Association code of conduct for marine wildlife operators’. O’Connor *et al.* (2009) found that at the time of their study there are five main codes of conduct used by over 50 operators in Scotland. In 2006 Scottish Natural Heritage (SNH), the Scottish Government’s statutory nature conservation advisers, produced the *Scottish Marine Wildlife Watching Code*² (SMWWC), as a duty under part 3 section 1 of the Nature Conservation (Scotland) Act 2004. The other four codes have been produced by non-governmental organisations (NGOs) over the past 13 years: the WiSe (**W**ildlife **S**afe) accreditation scheme, Wild Scotland (Scottish Wildlife & Adventure Tourism Association), Whale and Dolphin Conservation, and the Sea Watch Foundation. A sixth code of conduct produced by the Shark Trust (a UK NGO) provides specific guidance for viewing and swimming with basking sharks and is also followed by some operators. Collectively, these codes of conduct provide recommendations for recreational and commercial boat users on human behaviour that seek to limit disturbance to marine wildlife (Gjerdalan & Williams, 2000). However there is limited documented evaluation of the efficacy of the codes and few examples of monitoring. Therefore, it is difficult to suggest whether, or how well, the codes have been rigorously tested or evaluated through on-site monitoring and analysis.

In light of the diverse approaches outlined above and respective tensions and opportunities associated with marine wildlife tourism, this study sought to build on the work by Parsons and Woods-Ballard (2000) with a focus on reviewing the current consistency and effectiveness of voluntary marine wildlife-watching codes in Scotland. The degree to which formal regulation could contribute to achieving marine megafaunal conservation objectives was reviewed in order to align with innovative and emerging approaches of marine planning.

2. Materials and methods

2.1 Review of Scottish Marine Wildlife-Watching Codes of Conduct

A review of the five main voluntary codes of conduct used in Scotland was conducted in 2015: the Scottish Marine Wildlife Watching Code, Sea Watch Foundation, Whale and Dolphin Conservation, Wild Scotland and the WiSe Scheme Cetacean Code of Conduct. A compilation of the recommendations within these codes of conduct was assembled, with each recommendation being recorded once, even if present in multiple codes of conduct. The recommendations that differed

² <http://www.marinecode.org/documents/Scottish-Marine-Code-web.pdf>

between organisations were also noted, as well as analysed in more detail. Given the breadth of species that the codes of conduct apply, this study concentrates on the main groups and species that were considered to be the primary focus of marine wildlife-watching in Scotland, namely cetaceans (whales, dolphins and porpoises) and basking sharks (*Cetorhinus maximus*). They may be referred to collectively as *marine megafauna*.

2.2 Marine Wildlife-Watching Surveys

Over the summer of 2015, surveys were conducted with a marine wildlife-watching tour operator in the Sea of Hebrides to establish the effectiveness of codes of conduct at limiting disturbance to marine wildlife and to observe basking shark behaviour in response to swim-with interactions. The following surveys were conducted:

a) Marine Wildlife-Watching Survey

Marine wildlife-watching surveys were completed on a marine wildlife-watching tour boat operating out of Tobermory, Isle of Mull, which adheres to the WiSe Scheme code of conduct³. The survey was carried out over a three-week period at the end of June until the beginning of July 2015. The following information was recorded when a sighting was made by the observer:

- **length of encounter:** the time from when an animal was first sighted to when the animal was last sighted;
- **location of sighting:** using the on board Global Positioning System (GPS);
- **species and number sighted** (including recording the presence of a mother and calf/juvenile);
- **minimum approach distance:** the closest approach made by the boat to the animal, or by the animal to the boat;
- **behaviour of the cetacean when first sighted;**
- **behaviour of the cetacean when last sighted;**
- **number of other boats within a 0–300m radius and a 300m–1km radius** (0–300m is considered the caution zone for observing marine wildlife).

Sightings were recorded only when made by the observer; the sightings made by crew or passengers were not recorded. The minimum approach distance was estimated by unaided eye, using boat length to calibrate distance (Dawson et al., 2008). This technique was used because no laser finder was available to the observer and the nature of the tours meant that line transect surveys were not possible (Dawson et al., 2008).

³ http://www.wisescheme.org/?page_id=1128

The minimum approach distance, the length of the encounter and the presence of other boats were recorded to determine whether the code of conduct was being correctly followed.

Behaviour was recorded when the animal was first sighted and when the animal was last sighted. This was to establish if any changes in behaviour occurred as a result of boat presence to evaluate whether disturbance had resulted from the encounter (Lusseau, 2004). Behaviour was categorised as travelling, milling, socialising or foraging, modelled using Gill *et al.* (2000), Constantine *et al.* (2004) and Stockin *et al.* (2009) descriptors for common bottlenose dolphin (*Tursiops truncatus*), short-beaked common dolphin (*Delphinus delphis*) and northern minke whale (*Balaenoptera acutorostrata*) behaviours, respectively. The different behaviours are defined as follows:

1. Travelling: making headway with constant movement in one direction;
2. Socialising: close contact between individuals, with leaping sometimes being observed;
3. Foraging: observed attempting to catch prey. Behaviour may include rapidly swimming in circles and deep diving, but distinct from socialising in that no contact between individuals is observed;
4. Milling: frequent changes in direction, making no headway.

Lusseau (2004) suggests that horizontal avoidance techniques, such as travelling, are used by bottlenose dolphins to avoid interactions with boats. Therefore in this study a behavioural change that results in a horizontal avoidance technique that removes an animal from an interaction will be considered avoidance behaviour in response to disturbance from boat presence (Lusseau, 2004).

b) Basking shark behaviour

In light of the growing interest in basking-shark tourism in Scotland and a proposed MPA for this species (Sea of Hebrides), there is a need to better understand the potential effects of the presence of human swimmers on basking sharks and the respective codes of practice. Observational and anecdotal information was obtained from three basking shark swim-with charters from 11–25th July 2015; however, the touristic focus of the charter precluded employing a more formal quantitative approach.

The first two charters were five-day long trips and involved experienced divers and photographers, many of which had previously carried out in-water filming of marine mega-faunal species. The third charter was one-day long and consisted of mixed-experience snorkelers, some of whom had previously interacted with basking sharks.

Despite the previous experience of the swimmers, they were briefed by the crew regarding how to adhere to the Shark Trust Basking Shark Code of Conduct at the beginning of each charter. Swimmers were advised to swim on their side to minimise splashes as potential disturbance from finning as well as staying in their pairs rather than forming groups in the water. The swimmers were taken within 100m of a shark and 2 at a time entered the water from a dive platform at the back of the boat. Once a pair had entered the water another 2 swimmers would be taken within 100m of the same shark but from the other side to its swimming trajectory. The skipper and crew then observed swimmers and sharks, signalling from the boat the direction the nearest shark was to them and also standing by if the swimmers were ready to be picked up by the boat. After 10 minutes, the boat would pick up the swimmers and bring them aboard and another two persons could then enter the water. In the anticipation of a swim-with basking shark encounter, data collection sheets were taken on board by the crew, and information was recorded for each encounter (Appendix A). Comments from the skipper and crew were noted as observational information in an attempt to identify potential factors influencing basking shark behaviour, which in future could direct more specific areas of study or improve the codes of conduct.

The briefing given to the swimmers at the beginning of each charter included the main points emphasised by The Shark Trust Basking Shark Code of Conduct, which are as follows:

- Maintain a distance of at least 4 metres from each shark and be wary of the tail
- Do not try to touch the sharks
- Do not swim towards them if they are near you
- Ideally, swimmers should remain on the surface and stay in a small group rather than stringing out around the sharks
- No more than four people should be in the water within 100 metres of a shark at any one time

The locations visited to search for sharks depended on the most recent sightings from boats in the area that had contacted the skipper. The first two days of the first charter were spent around the islands of Coll and Tiree (Figure 1). After sightings from other vessels were reported near St Kilda, the last three days were spent travelling to and searching the surrounding waters of St Kilda (Figure 1). The next two charters were spent around the north end of Coll, as by this time (22nd–25th July), sharks had been sighted there in larger numbers.

Figure 1: Locations of shark encounters
(see separate file)

2.3 Marine Wildlife Tour Operator Questionnaire

A questionnaire was distributed to 27 marine wildlife-watching tour operators on the west coast of Scotland. These operators were chosen based on information on their websites that suggested their tours travel into the Sea of Hebrides proposed MPA. The questionnaire consisted of eight questions (Appendix B) with the option of providing comments at the end. It was compiled to establish how many tour operators on the West Coast travel into the Sea of Hebrides proposed MPA, how many of them already use codes of conduct and which codes of conduct they follow.

3. Results

3.1 Review of Scottish Marine Wildlife-Watching Codes of Conduct

In total, 51 recommendations were identified in the codes of conduct of the five organisations (Appendix C). The WiSe Scheme, the Scottish Marine Wildlife Watching Code and Wild Scotland provide species-specific codes of conduct for watching cetaceans, basking sharks and birds. Whale and Dolphin Conservation does not provide species-specific codes of conduct but does recommend using the Scottish Marine Wildlife Watching Code as a reference for appropriate encounter behaviour with different species. The Sea Watch Foundation only provides a code of conduct for cetaceans. In all the cetacean codes of conduct, some recommendations are made specifically for dolphins in relation to bow riding; however, in general there is no distinction made between the recommendations for whales, dolphins and porpoises except for minimum approach distances.

The Sea Watch Foundation, the WiSe Scheme Cetacean Code of Conduct, the Scottish Marine Wildlife Watching Code of Conduct and Whale and Dolphin Conservation provide some explanation of the consequences for marine wildlife if certain recommendations are not followed. Wild Scotland does not provide reasoning behind certain recommendations but does suggest referring to the Scottish Marine Wildlife Watching Code for further reference, which does provide rationales.

There are some points where the above organisations agree in their recommended guidelines for marine wildlife-watching, including:

- do not swim with marine wildlife;
- if an animal approaches to bow ride, maintain a steady course and speed;
- never chase the animals;
- do not interfere or separate mothers and calves and avoid close approaches to

mothers and calves;

- do not feed the animals.

However, there are some inconsistencies in the more precise aspects of the codes of conduct (Table 2); for example, the approach speeds, minimum approach distances, minimum approach distances when other boats are present and the maximum length of an encounter.

Table 2: Identified inconsistencies between the Scottish voluntary codes of conduct: Scottish Marine Wildlife Watching Code (SMWWC), the WiSe Scheme (WiSe), Wild Scotland (Wild), the Sea Watch Foundation (SWF) and Whale and Dolphin Conservation (WDC). (see separate file)

3.2 In situ use of codes of conduct and megafauna behavioural observations

a) Marine Wildlife-Watching Survey

A total of 90.4 hours were spent at sea on 17 marine wildlife-watching trips over the three-week period from the end of June to the beginning of July. During that time, there were 55 cetacean sightings on 10 of the trips, but no sightings of marine megafauna on 7 of the trips.

The recommended distance for sighting porpoises, dolphins and whales according to the WiSe Scheme is 100m. 20% of initial harbour porpoise, bottlenose dolphin or common dolphin sightings occurred within 100m, and 9% of minke whale sightings were made within 100m. These occasions were the result of animals approaching the boat or surfacing in close vicinity to the boat, either on first sighting or once an approach was made in the general direction of a distant sighting, resulting in unintentional non-compliance (Wiley *et al.*, 2008).

In total, 11% of interactions (two bottlenose dolphin encounters, three common dolphin encounters and one minke whale encounter) exceeded the 15 minute recommended encounter limit according to the WiSe Scheme. The recommended encounter length was not exceeded in harbour porpoise sightings. During four encounters, bottlenose dolphins and common dolphins were bow riding and travelling with the boat, and when the dolphins left the interaction the boat did not follow. On these occasions, it may appear that the boat was not abiding by the code of conduct, but in practice the boat followed the recommended code of conduct by maintaining a steady speed and course while the dolphins were bow riding. During the minke whale encounter, the minke whale approached the boat, which stopped, and the minke whale proceeded to closely interact with the boat. This may have

contributed to exceeding the recommended length of encounter as appropriate protocols were followed for a close approach situation, including maintaining a stationary position. During one of the common dolphin interactions, the dolphins were spotted at a distance of 1km and approached to a distance of 200m. On approach, the dolphins began travelling in the opposite direction to the boat, at which point the boat remained stationary. The recommended encounter length was exceeded; however, the majority of the encounter was not spent in close proximity to the dolphins but at a considerable distance.

The WiSe Scheme recommends that no more than two boats are present within 1km during an encounter. There were no sightings where more than two boats were present within 300m (the caution zone) during an encounter, and six sightings where three or four other boats were present during an encounter within 300m–1km. In most cases when an animal was sighted, other boats within 1km were likely unaware of the presence of the animal, and no crowding of an animal was recorded. This could account for the presence of more than the recommended number of boats within the 1km range.

Surface changes in behaviour may suggest that boat presence had an impact on harbour porpoise behaviour from first to last sighting on two occasions, however, on both these occasions the boat was already stationary or stopped in response to the sighting, and no other boats were present within 300m. Therefore the crew could be considered to have reacted appropriately for the situation and along the recommended guidelines to limit disturbance. Minke whale behaviour observed during the surveys was always travelling, both on first and last sighting.

On four of the five occasions when a change in behaviour was recorded for bottlenose and common dolphins, it was not considered disturbance because the change was a result of the dolphins interacting with the boat. On one of those occasions, however, a group of common dolphins were sighted approximately 1km away and an approach was made to around 200m. On approach, the dolphins travelled away from the boat, which could be considered avoidance behaviour in response to disturbance. The boat did not follow, as per the recommended guidelines, and later that day the same group was spotted and interacted with the boat for 26 minutes before leaving the encounter. Therefore, it could be suggested that the boat caused an initial disturbance during the first encounter. However, it did not have a long-term negative effect on the dolphins as they later interacted with the boat.

b) Swim-With Basking Sharks Observations

From observational experiences (Tables 3&4) from the skipper and crew during the two week period of swim-with shark charters, the more experienced group of swimmers (encounters 1&2) were more relaxed in the water and maintained their separated pairs, which made their movement in the water more gentle and controlled. The less experienced group, however (encounters 3&4), despite being briefed on the code of conduct prior to entering the water, put more effort in to energetic finning in the water and also tended to cluster into larger groups, despite being prompted to stay in groups of two by the skipper.

Table 3: see separate file

Table 4: see separate file

From the anecdotal information collected, larger sharks did not appear to change their course of direction according to the boat, whereas smaller sharks (<4m) tended to dive or change direction on approach to swimmers who entered the water ahead of the shark's trajectory. Sharks that were feeding displayed fewer responses to the swimmers in the water. Feeding behaviour was assumed where sharks were seen swimming with their mouths open, the gill plates clearly visible from the crew on the boat and swimming relatively slowly. Sharks that were recorded as travelling tended to change their course when they were approached by the swimmers. Sharks that displayed courtship behaviour (e.g. nose to tail following) were not approached to comply with the Shark Trust code of conduct.

3.3 Operator Questionnaire Results

In total, there were seven responses to the questionnaire, resulting in a 26% response rate. Of those seven responses, four of the operators travelled into the Sea of the Hebrides proposed MPA, and all respondents stated that they followed one or more code of conduct. However, from the inconsistencies in the recommendations highlighted by the analysis of the codes of conducts (see 3.1), it may not be possible to clarify which specific recommendations the operators adhere to. All respondents were WiSe Scheme accredited, with the SMWWC and Whale and Dolphin Conservation code being used by five of the respondents. The Wild Scotland and Shark Trust codes were also cited, and three respondents stated that they followed a code of conduct they had developed themselves.

4. Discussion

Through qualitative and quantitative observations of wildlife-watching tour operators and the behaviour of some of the species they seek to encounter, this study has highlighted varied benefits and issues around the regulation of wildlife-watching activities in Scotland. It is evident from the operator

questionnaire and by reviewing operators' business websites that the majority of operators place a conservation value on marine wildlife by seeking to abide by at least one authoritative code of conduct. Through *in situ* observations of one operator during the summer season in 2015, it may be concluded that the operator adheres stringently to the code they follow, and in doing so, the impacts on megafauna encountered were likely minimised. However, as the wildlife-watching and marine tourism industry in Scotland has the potential and indeed is poised to expand (Howard and Parsons, 2006), there are a number of issues that need to be addressed going forwards, in addition to scientific and social research needed to better understand the potential impacts of human disturbance on marine megafauna. Lessons must also be learned from other locations where the negative environmental and socio-economic impacts of increasing wildlife-watching have been clear, such as in Crystal River, Florida where regulations to reduce harassment for the federally-protected Florida manatee (*Trichechus manatus latirostris*) are not well enforced (Sorice et al. 2006). This will be essential in order to ensure that the tourism industry can grow within the limits of sustainable development.

4.1 Review of Marine Wildlife-Watching Codes in Scotland

The key point under which to frame this discussion is noting the complex and potentially confusing regulatory landscape of the Scottish marine wildlife-watching industry.. The five main voluntary codes used in Scotland have changed since Parsons and Wood-Ballard's assessment (2003). This is partly due to legislative provision (i.e. SNH's SMWWC under the Nature Conservation (Scotland) Act 2004), but also potentially also due to increasing scientific understanding of the impacts of wildlife-watching (Parsons, 2012), and increased stakeholder involvement. In addition, some recommendations may have been developed from previous codes, while others have been updated to incorporate advances in scientific understanding. This has resulted in codes containing various recommendations with inconsistencies in some of the precise aspects of the codes (see Table 2), resulting in. potential confusion for boat operators as to which guidelines to follow and differences in measures undertaken. As a result, it is not unusual for operators to follow more than one code, as highlighted by the operator survey (see 3.2), or to create their own (Garrod and Fennel, 2004). Inconsistencies in the different codes' recommendations indicate that there are still significant research gaps of the impacts of wildlife-watching on marine animals, including specifically behavioural responses of charismatic marine mega-fauna to boat activity. Whilst there are numerous codes, there is little effort or evidence to ensure that these codes are adhered to, or that they are effective in achieving their aim to reduce impacts on marine wildlife.

Not all of the codes of conduct analysed provide explanations for the scientific or obvious basis for respective recommendations. Gjerdalan & Williams (2000) and Garrod & Fennel (2004) suggest that codes of conduct that do not seem reasonable or understandable to the user are usually not practiced.

By providing an explanation of why a recommendation has been made (for example, ‘Avoid close approach to cetaceans with young. You risk disrupting mother-calf bonds and expose inexperienced young to stress and possible boat strikes’ (WiSe Scheme Cetacean Code of Conduct)), the consequences of actions can be better understood, which can encourage the uptake of codes of conduct on a voluntary basis (Gjerdalan & Williams, 2000; Garrod & Fennel, 2004).

One of the commonalities of the five main codes used in Scotland is a recommendation against swimming with marine wildlife. Swim-with programmes are an emerging aspect of marine wildlife-watching, and in Scotland, a small number of operators offer opportunities to swim with basking sharks and seals. As a result, adherence to the majority of existing guidance does not occur and without resulting enforcement or repercussion to date. This is notable given the legal basis of SNH’s SMWWC, which recommends against intentionally swimming with any marine animal. As previously mentioned, a specific code of conduct guidance for in-water interactions with basking sharks has been produced by the Shark Trust, upon which at least one operator in Scotland bases their swim-with activities. It should be noted that the Shark Trust code of conduct, while providing guidance for in-water interactions with basking sharks, initially suggests that swimming with sharks is not advisable and that the guidance is offered in the event that this type of interaction is not avoidable. The impacts of direct human interaction with large marine wildlife species are not well understood, which in itself could be rationale for a more precautionary position against the practice. The observational results (see 3.2) collected on the swim-with shark excursions do not provide data suitable to test whether the swimmers had any significant effect on the basking shark behaviour, and the behaviours recorded in this small sample are inadequate to draw any meaningful conclusions.

However, the results raise questions that may be addressed by future behavioural studies to better understand swim-with shark interactions and potential effects on sharks. These experiences may be valuable for education and outreach potential; some existing studies and anecdotal testimonials have highlighted positive effects on humans, particularly in the case of naturally sociable species, such as seals and dolphins. The evidence base for impacts of swim-with on basking sharks is limited; however numerous studies have documented the implications of swimming with whale sharks (*Rhinocodon typus*) in pacific countries where such activities are a major tourist attraction, such as Australia and the Philippines. For example, Quiros (2007) found that whale sharks in the Philippines change their behaviour in response to a variety of human stimuli, such as touching, path obstruction and proximity of swimmers, and the magnitude of the disturbance was also significantly influenced by different approaches. The same study noted that different facets of the code of conduct had different levels of average compliance (e.g. minimum distance = 44%, no flash photography = 99%). A number of human safety considerations are also potential issues for swim-with tours, not least the possible reciprocal transfer of pathogenic organisms between humans and marine wildlife (Bailey *et al.* 2015),

which may prevent the introduction or expansion of cetacean swim-with in Scotland. However, this should be a consideration for seal swim-with, as disease can be reciprocally transferred to domestic dogs.

Evidence exists in which marine animals, cetaceans in particular, have also been documented to negatively change their behaviour in the presence of humans, including visual or noise-related disturbance (e.g. reduced resting time, changes in breathing rates - Hastie *et al.* 2003; Visser *et al.*, 2011; New *et al.*, 2015), avoidance or aggression (Constantine and Baker, 1997; Visser *et al.* 2006). In addition, some marine animals have been known to become habituated to human presence (Samuels and Bejder, 2004), although habituation and sensitisation can be difficult to distinguish, and it has been demonstrated that an animal might not leave an area because it cannot afford to do so from a bioenergetic perspective (Beale and Monaghan, 2004). However, displacement from cetacean watching has been documented (Richter *et al.* 2003; Bejder *et al.*, 2006). Approaches by animals can result in unintentional non-compliance as porpoises, dolphins and whales can approach closer than recommended and for longer than recommended (Wiley *et al.*, 2008), and other boats may not be aware of the presence of cetaceans, especially the smaller species such as porpoises. From observations made on the wildlife-watching trips monitored for this study, the crew reacted appropriately according to the recommended guidelines when these situations occurred. As a result, there was only one incident of potential disturbance recorded in this study overall, and it could be considered that following voluntary guidelines keeps disturbance of marine wildlife to a minimum.

4.2 Voluntary or Statutory Regulation?

All wildlife-watching codes, particularly the SMWWC, have a statutory basis in that it is illegal to harass or harm cetaceans, sharks and seals under the Nature Conservation (Scotland) Act 2004, and codes of conduct provide recommendations for behaviour to prevent such incidents. These recommendations should be considered by operators to be a minimum, ensuring as little impact as possible on wildlife. Given this statutory basis, monitoring to understand the effectiveness of existing guidance and any resulting impacts would also appear to be important. Anecdotal evidence indicates that in Scotland, general adherence to wildlife-watching code guidelines may be relatively high (with the exception of recommendations against swim-with programmes, as previously mentioned), but as with any regulations, there is no guarantee (or indeed evidence) that all operators or indeed their guests will fully abide by them. Whilst the majority of people who engage in wildlife-watching activities are likely to be highly environmentally motivated (by the very nature of the attraction of the activity), appropriate behaviour still requires operators to communicate and enforce codes of conduct to their guests. Statutory regulation ensures a level playing field for all operators, certainty in any rules or ‘caps’ in numbers of vessels and accountability for any contraventions. Furthermore, a single

set of statutory regulations should be more transparent and less confusing than several voluntary codes that offer different recommendations. Monitoring through regulation would provide a better understanding of the current extent and locations of the industry, future changes and perceived ‘hot spots’ or bottle necks where further management may be required, as well as enabling the assessment of cumulative impacts with other sectors. Enforcement will continue to be a challenge as Scotland’s competent authority, the Police service, have little capacity to monitor the marine area (Simmonds, 2000).

Some of the comments in the responses to the operator questionnaire demonstrate practically some of the advantages and disadvantages of the codes of conduct used in Scotland and of voluntary codes of conduct in general. The first is related to operators’ compliance to the codes: *‘One particular boat that operates in the same area has an adverse effect on whales, and they leave as soon as he arrives.’* This statement is highly subjective and may suggest that the operator may be causing disturbance to marine wildlife, but it may also indicate competitive rivalries between operators. The former, highlights a failing of voluntary codes of conduct as compliance cannot be centrally monitored and enforced (Allen *et al.* 2007). Another comment relates to the regulation of commercial and recreational boats that may disturb marine wildlife: *‘wildlife is affected by more than just tour operators ... the leisure users of sensitive areas generally, in my opinion, do not have a level of understanding regarding wildlife and their impact on it.’* This suggests that further outreach may be helpful in order to target a wider audience, as referenced in the marine tourism policies in Scotland’s National Marine Plan (Lancaster *et al.* 2014). It should be noted that the SMWWC states that it is designed for all recreational sea users and activities, which indicates that the full range of intended audiences of this code may not be aware of its application to their area of interest.

Conclusions

As a growing part of the developing marine tourism industry in Scotland, wildlife watching can play a key role in wildlife monitoring and conservation, raise public awareness of environmental issues, and support local coastal communities and contributions to national economies. A coherent code of practice is essential to guide marine users, including wildlife-watching tour operators, to behave responsibly around marine wildlife. Based on the syntheses in this paper, however, inconsistencies and drawbacks of the current multiple codes used in Scotland compromise the benefits of having such codes. Furthermore, a precautionary approach is required to advise against the further development of swim-with programmes in the Scottish tourism industry. Assuming the operations that exist will continue, despite the codes that are in place, dedicated research is needed to quantify the scale and longevity of the effects of swim-with programmes on their target species and participants in Scottish waters. Research might usefully be focused in designated protected areas, such as nature conservation

MPAs, SACs and designated seal haul-out sites, where legislation has been established for the protection of key functions or life stages of a population or species (e.g. breeding, resting or feeding). In the meantime and as a precautionary measure, swim-with activities should be brought within a regulatory framework to prevent them expanding. For example, the disturbance of seals at haul-out sites to encourage them into the water should be prohibited.

As a minimum requirement and to curtail unnecessary regulatory burden on an existing and potentially expanding industry, one option could be to introduce local wildlife-watching regulations (potentially based on or additional to local Biodiversity Action Plans) and associated monitoring of effectiveness in protected areas through Regional Marine Plans. This would be a mechanism that could ensure that local data and knowledge is incorporated and the regulations will match the needs of the local conservation objectives, resident and transient wildlife in the region and local operators. Such regulations should be driven by government/statutory agencies, with the support of local operators and communities to cultivate a sense of ownership and ensure suitable compromises where necessary.

The following recommendations are suggested to improve the current approach and appreciation of regulating marine wildlife-watching in Scotland to benefit both nature conservation and the experience of marine users:

- Government-facilitated but locally-led development of a single comprehensive wildlife-watching code where operator and scientific input and support is considered – current codes need to be consolidated and consistent recommendations agreed;
- Area-specific regulations and caps in operator numbers must be scientifically explored and implemented and should account for local populations (e.g. bottlenose dolphins in the Moray Firth SAC);
- A central database should be set up to include a list of all operators and other pertinent information (such as those who are WiSe-accredited) and collect scientific data, information on which code is followed and primary activities that are undertaken, etc.;
- Greater public awareness of wildlife-watching codes is necessary to ensure good practice by all leisure users (including within MPAs where attention might be focused);
- Further scientific research to better understand the impacts of boat-based watching and swim-with is urgently required (possibly involving operators as platforms – New *et al.*, 2015) and appropriate resulting recommendations and enforcement is necessary;
- Scottish Regional Marine Plans could consider the introduction of statutory regulations in ecologically sensitive areas (e.g. MPAs). This would support the National Marine Plan objectives for marine tourism and could also contribute to the UK's biodiversity and

sustainable development commitments, such as the Convention on Biological Diversity and Marine Strategy Framework Directive targets to achieve good environmental status by 2020.

The above recommendations provide opportunities to establish more meaningful codes of conduct for mobile species, and when aligned with MPAs may provide critical life-history anchors for trans-boundary and migratory species, as well as supporting sustainable and ecologically positive tourism. The proposed MPA in Scotland's Sea of the Hebrides provides a potential innovative opportunity to trial effective management for marine wildlife-watching activities. Such efforts, can foster research opportunities and knowledge exchange amongst diverse groups of stakeholders and help ensure long-term protection of these special marine species globally, as well as long-lasting enjoyment by generations of observers..

Acknowledgements

The authors gratefully acknowledge the contribution of Sea Life Surveys who facilitated data collection for this research. Thanks also to Dr Adam Brooker (University of Stirling) for proof-reading this manuscript, and the reviewers for their comments.

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Table 1: Summary of spatial protection measures for cetaceans, pinniped and chondrichthyan species in Scotland (up-to-date March 2016)

Species	Designation	Directive	Current status	Management measures
<i>Cetaceans</i>				
Bottlenose dolphin (<i>Tursiops truncatus</i>)	Special Area of Conservation (Moray Firth)	EC Habitats Directive	Designated	Moray Firth SAC Management Scheme
Minke whale (<i>Balenoptera acutorostrata</i>)	Nature Conservation MPA (Sea of the Hebrides; Southern Trench)	Marine (Scotland) Act 2010	Proposed	N/A
Risso's dolphin (<i>Grampus griseus</i>)	Nature Conservation MPA (Northern Minch)	Marine (Scotland) Act 2010	Proposed	N/A
<i>Pinnipeds</i>				
Harbour seal (<i>Phoca vitulina</i>)	Special Area of Conservation (Ascrib, Isay and Dunvegan; Dornoch Firth and Morrich More; Eileanan agus Sgeiran Lios mòr; Firth of Tay & Eden Estuary; Mousa; Sanday; South-East Islay Skerries; Yell Sound Coast)	EC Habitats Directive	Designated	Fisheries management measures under development
	Seal Haulout Sites (194, Scotland-wide, both species)	The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (under Marine (Scotland) Act 2010)	Designated	Harassment of seals at designated sites prohibited

Grey seal (<i>Halichoerus grypus</i>)	Special Area of Conservation (Faray and Holm of Faray; Isle of May; Monach Isles; North Rona; Treshnish Isles)	EC Habitats Directive	Designated	Fisheries management measures under development
	Seal Haulout Sites (194, Scotland-wide, both species)	The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (under Marine (Scotland) Act 2010)	Designated	Harassment of seals at designated sites prohibited
<i>Chondrichthyan</i>s				
Flapper [prev. common] skate (<i>Dipturus flossada</i>)	Nature Conservation MPA (Loch Sunart to the Sound of Jura)	Marine (Scotland) Act 2010	Designated	Zonal demersal trawling and dredging restrictions.
Basking shark (<i>Cetorhinus maximus</i>)	Nature Conservation MPA (Sea of the Hebrides)	Marine (Scotland) Act 2010	Proposed	N/A

Table 2: Identified inconsistencies between the Scottish voluntary codes of conduct: Scottish Marine Wildlife Watching Code (SMWWC), the WiSe Scheme (WiSe), Wild Scotland (Wild), the Sea Watch Foundation (SWF) and Whale and Dolphin Conservation (WDC).

	SMWWC	WiSe	Wild	SWF	WDC
Minimum approach distance	50m for dolphins and porpoises, 100m for whales, 200–400m for mothers and calves	100m	50m for small cetaceans, 100m for whales	100m	100m
Minimum approach distance when other boats present	No more than 2 vessels within 300m	No more than 2 vessels within 1km	No more than 2 vessels within 100m	No more than 2 vessels within 1km	No more than 2 vessels within 200m
Time spend in the vicinity of an animal	15 minutes when other vessels are present, 30 minutes if single vessel	15 minutes	No recommendation	20 minutes	15 minutes
Speed on approach to animal	Slow down to 6 knots when at least 300m away, some recommend 1km	Slow down to 6 knots within 1km	No recommendation	Do not exceed 10 knots within 1km	No recommendation

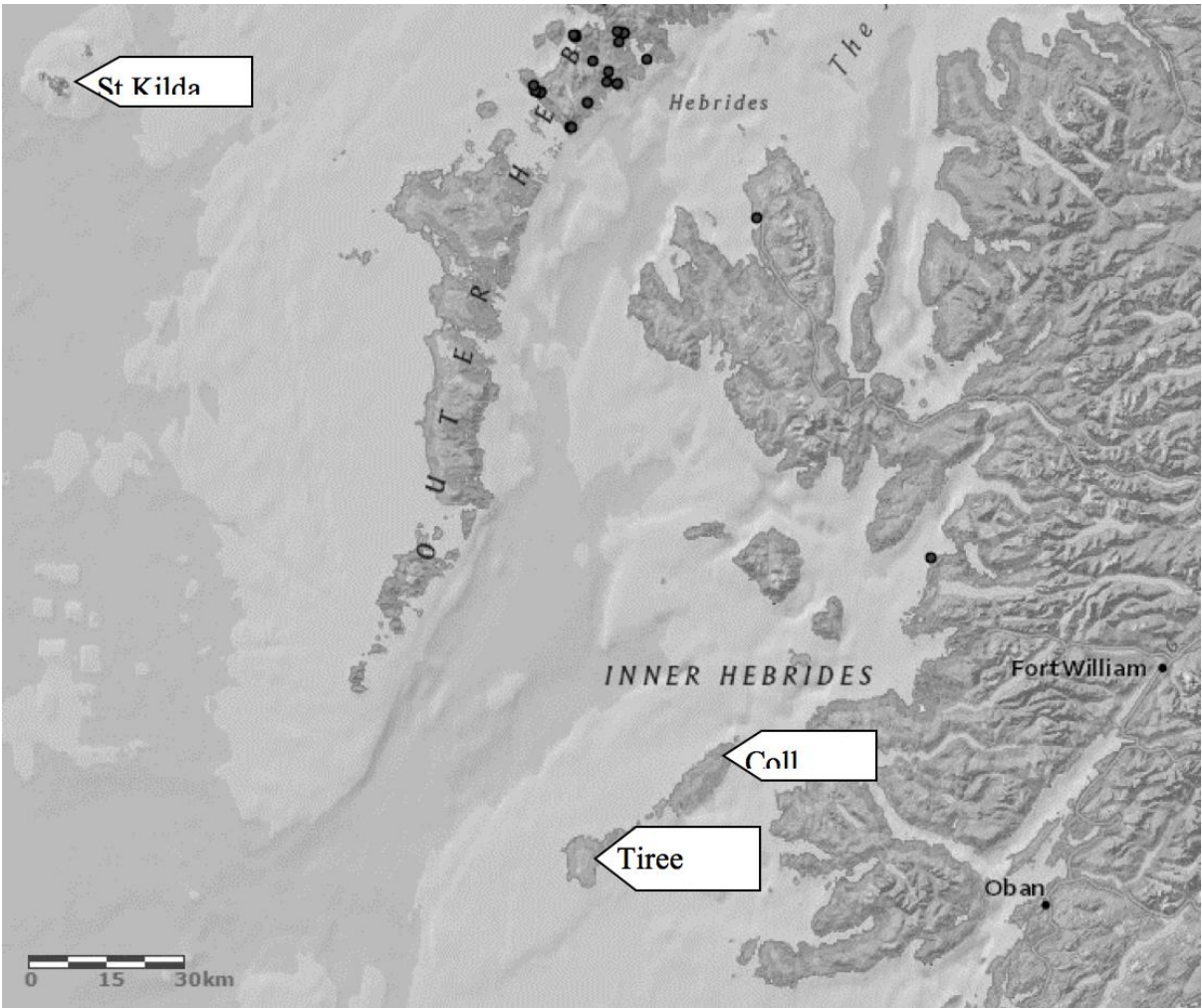
Table 3: Swim-with basking shark observations - boat conditions.

Encounter No.	Date	Time when boat leaves harbour	Sea state	Weather conditions	Location: lat, long	Time of observation	Direction of boat approach to basking shark	Distance between boat and basking shark (m)	Number of other boats within 100m radius	Basking shark behavior before swimmers enter the water	Time when swimmers enter the water
1	16/07/15	0600	2-3	clear	57.805322, -8.564308	1430	Side	50	2	travelling	1445
2	22/07/15	0600	3-4	overcast	56.556798, -6.740578	0945	Side/in line	100	0	feeding	1030
3	23/07/15	0600	2-3	clear	56.556798, -6.740578	0900	Side	75	1	feeding	1030
4	25/07/15	0930	1-2	clear	56.556798, -6.740578	1200	Side	100	0	feeding	1215

Table 4: Swim-with basking shark observations - swimmer and shark interactions.

Encounter No.	Number of basking sharks present during interaction	Size of basking shark(s) (m)	Number of swimmers in water	Direction of swimmers approach to basking shark	Min. distance between swimmers and basking shark (m)	Max. distance between swimmers and basking shark (m)	Was the basking shark touched during the interaction? If yes, how many times?	Time when the swimmers return to the boat	Time when basking shark last observed	Time when boat returns to harbour
1	2	3-4	3	Rear-left	2-3	15+	N	1600	1730	0000
2	7	7-9	3	Side, in line	2-3	15+	N	1230	1330	1600
3	10	6-8	4	Side	2-3	15+	N	1300	1500	1700
4	15	7-9	4	Side	1-3	15+	N	1430	1500	1700

Figure 1:Locations of shark encounters



(ArcGIS 2016)

Supplementary Material for on-line publication only
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***Detailed Response to Reviewers**

Ms. Ref. No.: OCMA-D-16-00159

Title: The use of marine wildlife-watching codes and their role in managing activities within marine protected areas in Scotland.

Ocean & Coastal Management

Dear OCM Team,

Kindly find our responses to comments by 3 reviewers, detailed below.

These comments are reflected in the revised manuscript. With regard to the manuscript, we provide one version w/ 'track changes' as evidence of our incorporation of the reviewer's excellent suggestions.

I also provide a 'FINAL' manuscript, which has accepted all the track changes and serves as a final clean copy.

Thank you in advance for your kind consideration of our resubmission.

We look forward to working with you to progress this manuscript towards publication.

Sincerely,

Dr. Meriwether Wilson (corresponding author).

12 July 2016

No.: OCMA-D-16-00159

Title: The use of marine wildlife-watching codes
and their role in managing activities within marine protected areas in Scotland.
Ocean & Coastal Management

Reviewers' comments and Responses:

[NB: In light of the length of Reviewer No 2's comments and our responses, we provide the comments and responses in the following order: no 1 > no 2 > no 3.]

Reviewer #1:

The article "The use of marine wildlife-watching codes and their role in managing activities within marine protected areas in Scotland" presents an interesting current issue deserving attention.

The combination of research techniques used by the actors adds to the publication.

I recommend revise and edit the article carefully ,to improve article's quality, making it more attractive for readers. There are some parts especially in the introduction, discussion and conclusions that could be expressed with more clarity.

Author Response: The document has been revised throughout.

These are some examples:

"A separate code on basking sharks is available in UK, specifically to guide incidental or unintentional in-water interactions with the sharks. In light of the growing network of wildlife focused MPAs in Scotland (in particular the Sea of Hebrides proposed MPA for mobile species) and national aspirations for the growth of the marine tourism sector, we consider the potential implications of unregulated wildlife watching and the conservation objectives of these sites".

Author Response: This has been revised and clarified.

It is not clear if the code for basking sharks is from the government or from one of the tour providers. Also the last sentence is not clear. "we consider the ... conservation objectives of these sites"?

Author Response: This has been revised and clarified.

Another example:

"There is an opportunity to establish mobile species MPAs in Scotland as innovative examples of effective management for marine wildlife-watching activities and the protection of mobile species. Management in Scottish mobile species MPAs could set a precedent for the rest of the UK and could be used as an example of management for future mobile species MPAs, both nationally and internationally". What do you mean by future mobile species?

Author Response: This has been revised.

In the last paragraph, there are 4 "mobile species" in 5 lines.

Author Response: This has been revised.

These are only some examples, the document needs to be revised entirely.

Author Response: The document has been revised throughout.

In sum to Reviewer 1:

The authors have gone through the manuscript in considerable detail, with attention to editing overall, as well as noting and amending the above examples. A 'track changes' version of the manuscript (along w/ a final - clean) has been provided to OCM should the reviewer wish to see the extent of editorial changes throughout.

Reviewer 3

1. Wildlife-watching and ecotourism can have multiple benefits, such as supporting conservation efforts through scientific data collection, employing and uniting local communities, and increasing public awareness about environmental issues. Therefore, this paper can serve as a useful reference to the countries where are developing the wildlife-watching business.

Author Response: Thank you.

2. This paper reviews the consistency of the voluntary codes of conduct and explores the potential impacts of wildlife watching with a focus on the adequate management of future activities. The review also incorporates data from field surveys, in-situ observations and operator questionnaires conducted in Scotland to better consider how codes are implemented in practice. Its materials and methods applied are adequate.

Author Response: Thank you.

3. As stated by the authors, the Scottish marine wildlife-watching industry is complex and potentially confusing. And, the five main marine wildlife-watching codes of conduct used in the Scottish tourism industry are voluntary and have each been developed by different authorities and stakeholders, including the Scottish Government and environmental NGOs. I am wondering if those authorities and stakeholders could be invited and work together to make the relevant conservation programs /codes of conduct more consistent and effective. I hope this point can be further discussed and/or included in the section of "conclusions".

Author Response: This comment (largely in the Discussion and Conclusions) has been noted and elaborated.

4. The authors mentioned that inconsistencies in the different codes' recommendations indicate that there are still significant research gaps of the impacts of wildlife-watching on marine animals, not all of the codes of conduct analysed provide explanations for their recommendations, codes of conduct should be understandable to the user, and further outreach may be helpful in order to target a wider audience. I will be more than happy to see the related policy recommendations that in response to those issues can be included in the recommendations of the last section.

Author Response: This comment (first in the Introduction, also the Conclusion) has been noted and elaborated.

5. Line 521 states, "marine wildlife, , but it may also indicate competitive rivalries between operators." The duplicated comma should be deleted. Thus, the authors are encouraged to check the paper's format and/or any typing error again.

Author Response: done

6. Since the paper is well done, it is also helpful for wide readers including scientists, ecotourism operators, statutory bodies and local communities on marine wildlife watching, I'd like to recommend the paper can be accepted by our OCMA with minor revision.

Author Response: Thank you.

Reviewer #2:

The paper misses one major issue related to codes of conduct in Scotland. The Nature (Scotland) Act 2004 contained a clause that required the production of a national set of wildlife guidelines. The act also made it illegal to recklessly disturb or harass wildlife and to aid prosecution it is deemed that activities that are prohibited in these guidelines are examples of harassment (see The conservation of British cetaceans: a review of the threats and protection afforded to whales, dolphins and porpoises in UK Waters, Part 2 - in The International Journal of Wildlife Law and Policy). The national marine animal watching guidelines were produced with stakeholder involvement due to the findings of Parsons and Woods-Ballard (2003) that there was a preference for locally produced guidelines.

Author response: We have added in reference to the Nature Conservation (Scotland) Act 2004, in relation to it being the legal basis for the Scottish Marine Wildlife Watching Code (developed by SNH in 2006).

line 34-36 - there are who,e papers specifically on the issue of whale-watching vessels as platforms of opportunity, which are better references than Brian Garrod and Dave Fennell's paper which just mentions the issue in passing. There is, for example, a standing agenda item on this in the International Whaling Commission (IWC - the international competent authority for the management of whales) sub-committee on whale watching, which is summarised every year in the report of the IWC scientific committee (see Journal of Cetacean Research and Management)

Author response: citation has been updated as per recommendation

For impacts of whale watching on target species there is a review by Parsons (2012). The IWC also produces an annual review with is published in the journal Tourism in Marine Environments, and is discussed in the IWC scientific committee report (published every year in Journal of Cetacean Research and Management)

45-46 - there is a much wider body of whale-watching impact literature than this. Note that the vessels in the Lusseau papers for Fiordland New Zealand are not technically whale-watching vessels but scenic tours, and are a category referred to as "incidental whalewatching" by the IWC.

Author response: citation has been updated as per recommendation

As this study has a large shark-watching component, where is the literature on shark tourism? In particular swim-with-whale shark tourism, or shark MPAs?

Author response: improved reference to such literature has been added in (e.g. line 116-119, revised draft).

46 - note that the Christensen et al. studies in Iceland have been heavily criticized by the IWC and whalewatching researchers for poor experimental design - the observed differences are likely to be the result of two different observation methodologies (one boat based and one land based) and data collected rom two different areas where minke whales behave differently, rather than differences due to whalewatching vessel presence.

Author response: citation has been updated as per recommendation

52 - What is an MPA? Some definition needed. Not that there many different types of MPAs and many MPAs are considered to be POOP (protection only on paper).

Author response: definition of an MPA has been inserted

63 - It would be worth citing several of the studies from this region which have shown poor compliance with these regulations, including by the author cited.

Author response: the paragraph between lines 60-69 (submitted draft) has been revised to better reflect the body of evidence on this subject.

77-80 - The manatees aren't a good example. Technically there are regulations, but boy are those animals harassed ! There are studies that show how ineffective the manatee regulations are.

Author response: this reference has been removed (but used later on in the paper between lines 461-464, revised draft, instead of the Kaikoura example – see reviewer comment on line 437, submitted draft)

111-129 - Some explanation is needed to discuss the differences between SACs designated under the Habitat's Directive. The assumption is that activities that have been undertaken in SACs must not be greatly impacting target species or these

areas would not have enough animals to be SACs, thus activities being conducted prior to designation (such as marine wildlife-watching around the Treshnish Isles SAC) is considered to be relatively benign.

It should be noted that species specific legislation probably has more impact for most key marine wildlife species e.g. all cetaceans are protected from disturbance and harassment by the Nature (Scotland) Act as well as the EU Habitats Directive (12nm to 200nm from the coast) - and various seabirds have a host of legal protections.

Author response: this has been clarified between lines 132-136 (revised draft)

For a review of legal protection on cetaceans see :

152 - Surely better references would be Arnold 1997 (The dolphin space programme. The development and assessment of an accreditation scheme for dolphin watching boats in the Moray Firth. Scottish Wildlife Trust, Scottish Natural Heritage and the EU Life Programme) or Parsons et al. 2003 (The value of conserving whales: the impacts of cetacean-related tourism on the economy of rural West Scotland - in Aquatic Conservation) which specifically talk about the local community economic benefits of marine wildlife tourism? For the value of marine wildlife tourism in Scotland also look at: Masters D, Nautilus Consultants, Carter J. (1998) Marine wildlife tourism: developing a quality approach in the Highlands and Islands. Tourism and Environment Initiative and Scottish Natural Heritage.

Author response: Arnold (1997) citation included, as per reviewer recommendation.

175-176 - The Parsons and Woods-Ballard study should be described as the current study is partly a repeat of what they did in 2000.

Author response: reference to this study has been added in lines 198 and 217 (revised draft)

179 - Note the legal basis on which the SNH code was produced. Also you need to explain to readers who SNH is...

Author response: both these points have been clarified (see lines 203-205, revised draft)

218 - The guidelines in the WiSe COC should be linked.

Author response: We are confused as to the reviewers meaning – ‘linked’ in terms of connecting the codes within the WiSe Scheme to the different target species of marine wildlife-watching (there are species/group-specific codes within this scheme)? As a response to this point, we have included a hyperlink as a footnote to the WiSe scheme webpage that lists these codes, which will allow the reader to explore further as they may wish, and to reduce the amount of text being added in to the paper.

226 - How were approach distances determined? With lazer range finders or my guestimating? How were estimated distances calibrated? What distance did the operator think they were at ? Guessing distances at sea is extremely difficult especially in poor weather conditions. Also how did you deal with bowriding animals, when they swim towards the boat, and where manoeuvring to avoid the animals might be more dangerous/disturbing?

Author response: information on how approach distances were determined has been added as per reviewer’s recommendation (see lines 253-256, revised draft). Bow riding animals are acknowledged on lines 352-356 (original draft).

241- Delete second comma and should be common bottle nose dolphin, short-beaked common dolphin and northern minke whale (there are multiple species of minke whales, common dolphins and bottlenose dolphin)

Author response: done

242- An incorrect assumption. Cetaceans, especially bottlenose dolphins, frequently travel. The BND in western Scotland travel great distances (sometimes tidally-induced movement) and are often travelling when first encountered.

Author response: point has been clarified to acknowledge reviewer recommendation (see line 272-275, revised draft)

285 - A map is needed to show these locations. in particular, how far St Kilda is from Tiree.

Author response: Map has been added from ArcGIS showing these locations in relation to each other (see line 346, revised draft)

Table 2 - Note these COCs are not independent. Many of the same people were involved in drafting multiple codes, and later codes used earlier codes as models. Some of the guidelines were changed in latter codes due to input from operators and scientists, which would explain some inconsistencies.

Author response: point has been acknowledged as per the reviewer's recommendation (see lines 466-468, revised draft)

345 - 11 sightings of 55 encounters - so 20% ?

Author response: done

349 - 6 of 55 ? 11%?

Author response: done

347 - See comment above about estimating distance. Also it should be noted whether the minke whales were approached and that's why they were closer than 100m or whether they headed to the general region and the minke whale popped up within 100m. Minke whales can travel underwater considerably, especially early in the whale-watching season, when they dive to the seabed (see papers on dive profile by Karin Stockin et al. and feeding behaviour and habitat use by Kelly MacLeod et al.)

Author response: point has been clarified as per reviewer's recommendation (see lines 362-365, revised draft)

353 - Who left and who did not follow? Dolphins or boat?

Author response: point has been clarified as per the reviewer's recommendation (see line 369, revised draft)

357 - "stopped" or "became stationary" is better than "brought to a stationary position"

Author response: done

377 - "milling" behavior is not a great category for porpoises. They can swim about considerably underwater and "travelling" and "milling" behaviour at the surface may not echo what is actually going on underwater - they could be foraging, mating, socializing or simply keep changing direction, which might be the result if disturbance. Also telling porpoises apart is very difficult and "travelling" and "milling" animals might actually a large number of almost identical animals surfacing. Anyway, caution should be used with harbour porpoise behaviour as the brief appearance at the surface may not be indicative of what is actually happening subsurface.

Author response: point has been amended as per the reviewer's recommendation (see line 390-394, revised draft)

399-400 - Some explanation is needed.

Author response: More information regarding the methodology of shark swim observations has been added for clarity, (see line 316-323)

405 - 410. Can we have some data? How many encounters and what percentages ? Was this statistically significant? This is more of an anecdote rather than data.

Author response: Tables showing observational data recorded have been added and edited to ensure it is clear that this is anecdotal data rather than statistically tested (see line 469- 473)

415 - What is the response rate? How many were approached?

Author response: a response rate has been added to the revised draft (see line 432, revised draft) and the number of operators approached can be found on line 291 (original draft)

433 - Citations on potential for expansion? How about survey by Claire Howard on public knowledge of marine wildlife tourism opportunities? (Public awareness of whale-watching opportunities in Scotland - in Tourism in Marine Environments)

Author response: citation has been added as per recommendation

437 - Kaikoura is often portrayed as a socioeconomic success - it was an economically impoverished area that is now a major tourism destination, with Maori-owned and operated companies.

Author response: Kaikoura example removed to avoid undermining this point, as per reviewer's recommendation and replaced with manatee example - see author response to reviewer's comment on lines 77-80 (original draft).

449 - See comment above. The codes were done at different times, but there has been an evolution with recent codes often using better scientific understanding and also with operator input. How do these codes compare to the ones described in Woods-Ballard & Parsons 2003?

Some of the inconsistencies might be issues that have arisen since the earlier codes, or items in earlier codes that were dropped because of irrelevance/ better scientific understanding.

Author response: point has been clarified as per the reviewer's recommendation (see lines 470-474, revised draft)

468 - The fact that swim-with activities occur is a failing of SNH to enforce the letter of the Nature (Scotland) Act.

Author response: acknowledged in line 498 (revised draft)

487 - Again, there are a lot more examples than this, and there are now studies on the bioenergetic impacts of this disturbance. There was a workshop in Glasgow in 2014 on the impacts of whalewatching and modelling short-term behavioural impacts in terms of population-level impacts which has been published in this very journal (New et al. 2015. The modelling and assessment of whale-watching impacts in Ocean & Coastal Management).

Author response: We acknowledge this and we have cited a number of references for these points (see lines 524-534, revised draft) and recognise that we could cite many more studies – in the interest of keeping this paper as short as possible (recognising it is already quite long) we have chosen to add in only the New et al. 2015 reference, as per the reviewer's recommendation. However, we have slightly restructured the paragraph between lines 511-522 (revised draft) to improve clarity and to reflect the reviewer's comments on lines 506 (original draft) and their early point about including more literature on shark swim-with tours.

506 - It's unlikely swim-with cetacean programs will start in Scotland for various logistic reasons, including swimmer safety.

Author response: acknowledged in context of discussion – see line

510 - This has been discussed by many authors including the IWC - operators may cherry pick less exacting guidelines, but could still be following guidelines. The Nature (Scotland) Act guidelines were intended to be a minimum (and if these are being disobeyed then harassment is occurring) - operators can use more rigorous guidelines if they wanted.

Author response: acknowledged in lines 542-546 (revised draft)

521 - Delete second comma.

Author response: done

522 - Technically the codes are not voluntary there are legal underpinnings, at least for cetaceans, as harassment and disturbance is illegal.

Author response: acknowledged in lines 542-546 (revised draft)

524 - This is referred to as "recreational whalewatching" by the IWC in their definitions (see "Glossary of whalewatching terms" in Journal of Cetacean Research and Management 8 (Suppl.), pp. 249-251) and has been discussed by other researchers (eg in New et al. 2015 in this journal, among others)

Author response: acknowledged, but no edit made as: i) the reviewer does not suggest a specific edit (although presumably they imply this definition should be formally cited in the text), and ii) this paper is in the context of marine wildlife-watching in general (albeit with specific reference to cetaceans and basking sharks), therefore we do not feel that this definition (specific to whale-watching) is necessarily needed or appropriate.

553- Introduced additional guidelines? If this is within the context of an MPA more stringent than the 2006 guidelines might be warranted, but these would have to be turned into regulations for MPA users.

Author response: we assume the reviewer means line 533, not 553. We have made no edit in response to this comment, as we feel our suggestion is clear enough: i.e. to develop local regulations through Regional Marine Plans which supersede voluntary codes and will satisfy the legislative needs of the area (e.g. MPA conservation objectives, Nature Conservation (Scotland) duties, as well as ensuring that all operators are working on a level playing field.

561 - *This has already been done. Also it is important that any guidelines are not government led but gov facilitated/sanctioned but ultimately locally led - the Hebridean Whale and Dolphin Trust would be the ideal lead.*

Author response: agreed, however not all operators follow this code and the main message of this paper is to call for improved consistency in how/which codes are followed. We have edited the sentence slightly for improved clarification on this point.

564- *Capping numbers should be done after scientific studies of carrying capacity otherwise the number of permits could be considered to be arbitrary and capricious. Use of Erich Hoyt's sustainability report card would be a good option to monitor locations.*

Author response: this sentence has been edited slightly for clarification, as per the reviewer's recommendation

566 - *Doesn't Wild Scotland have such a database?*

Author response: Wild Scotland does maintain a list of operators on their website, however it does not appear to be comprehensive (this is perhaps just a list of those who are signed up to/members of Wild Scotland) and does not include information about accreditation or codes of practice, as suggested is needed by the authors in this concluding point. We feel this point still stands as originally proposed.

569 - *This is probably key as most of the bad actors are "recreational" or "incidental" whalewatchers (to use IWC definitions). Many recreational whalewatchers are yachties that attend various regattas etc (although the regattas have issued wildlife guidelines in the past)*

Author response: agreed, although no edit made as it is not clear whether the reviewer is recommending an edit (unless just to emphasise the importance of the point)

571- *Research on impacts is being done. What sort of research? HWDT has a stack of theses on behavioural changes in response to boat traffic. Elly Roland is currently monitoring noise levels using Sea Life Surveys as a platform of opportunity. The research that is done needs to be strategic, and addressing a specific unknown.*

Author response: this sentence has been edited to reflect the reviewer's recommendation

576 - *On biodiversity objectives, have you looked at the Biodiversity Action Plans for the region or Local BAPs? These include issues related to marine wildlife tourism.*

Author response: we have included reference to LBAPs in line 580 (revised draft) and to the Convention on Biological Diversity in line 625 (revised draft), the commitment under which the LBAPs have been developed.

One of the problems in Scotland is that the competent authority for enforcing laws is the police, and they cannot monitor marine areas (see discussion on this issue in the International Journal of Wildlife Law and Policy article noted above, as well as discussion on legal protection of cetaceans vs whalewatching).

Author response: this has been acknowledged in line 609 (revised draft)

Some discussion is needed about the nature of marine wildlife (especially whale-watching) tourists in Scotland. They are extremely environmentally motivated and aware (there are numerous studies on this by Chris Rawles [Environmental motivation of whale-watching tourists in Scotland in Tourism in Marine Environments] and others) and this highly motivated pool of tourists in some ways ensures compliance with regulations.

Author response: this has been acknowledged in line 601 (revised draft)

Also, there are many studies on compliance with guidelines (or lack thereof) and this substantive body of work has seemingly not been reviewed (e.g. papers by Carol Scarpaci, Simon Allen, Claudio Corbelli, Kasey Stamation, Ashley Sitar and various others).

Author response: we acknowledge that there is research we have not been able to cite as part of this study. This is not a review paper and it is framed in the context of Scotland, and Scottish-specific species and examples (although we have referred to a limited number of international case studies for comparative purposes). In the interests of time and length of the paper, we have had to limit the amount of previous work we describe.

While this paper has some interesting results, the large discussion about MPAs isn't really relevant as many of the species are listed under the Nature(Scotland) Act and EU (not EC as listed in the table) Habitats Directive.

Author response: we are confused as to the reviewer's reference to the 'large discussion' about MPAs – presumably this refers to the sections in the introduction which explores the development of MPAs in Scotland for a number of species targeted by the wildlife-watching industry. We feel this is important context for the paper as, while these species have legal protection from harassment and harm in any part of Scottish waters (as the reviewer suggests) MPAs afford targeted spatial protection for important areas for the life history of some of these species. This study was primarily about exploring the implications of marine wildlife-watching (and the potential expansion of the industry) within the proposed Sea of the Hebrides ncMPA (proposed for basking shark and minke whale, but also a key area for watching numerous other marine species, including dolphins, harbour porpoise, sea birds, seals, sea eagles and otters, and a very popular recreational marine tourism hotspot for the same reasons). Therefore the implications for this study are important to consider in future management measures for such an MPA. We have decided to retain the text about MPAs for this reason, however we have attempted to consolidate this section slightly.

The authors would have done well to look into the history of guideline establishment in Scotland and would do well to talk with (or show drafts of their manuscript to) people such as Caroline Warburton, Mike Tetley, Mark Simmonds and others. There is a lot of relevant, even essential, research that has been done in Scotland on marine wildlife tourism (especially whalewatching), on codes of conduct and compliance, and on marine mammal MPAs and protection in the UK, which have not been touched upon in this paper.

Author response: we have discussed our paper with, and sent draft versions to, colleagues from the Hebridean Whale and Dolphin Trust (who have been involved in similar work, as also alluded to by the reviewer by line 571, original draft) and SNH (who have developed the SMWWC). We are happy to consult more widely with other colleagues, but feel that this may have further delayed submission of the manuscript and, given that SNH are currently revising the SMWWC, timing is fairly critical so that this paper may be usefully considered.

There is a lot of relevant work in the IWC annual reports if the Scientific Committee in particular. The authors missed major two workshops on marine wildlife tourism in Glasgow in 2014 on the topics of impacts and management (one of which published as New et al. 2015 in this journal and, as noted above, covers some of the issues discussed in this paper. A second one which is currently being written up by Carol Scarpaci discussed problems in, and management of, marine megafauna tourism including sharks) which would be useful for them to refer to. Many of their recommendations have been made before.

Author response: we have cited the New *et al.*, 2015 paper in response to a previous reviewer comment, and we have added in further detail about shark wildlife-watching and swim-with, also in response to a previous comment. We hope this will also satisfy this point, but again it would be challenging to incorporate all the literature on this subject and have tried to cite the most relevant to our study.

In summary, this paper is very useful, but it needs a more thorough grounding in the marine wildlife tourism/ policy literature.

Author Response: This has been taken into account and done through the above series of amendments and additions.